CHA Industries' patented series of rotary planetary fixturing are used in the thin-film deposition phase of microelectronic production, and are widely specified for use in CHA and other systems.

By applying Knudsen's cosine distribution law, CHA fixturing continuously changes each wafer's aspect to the evaporant stream. This ensures outstanding step coverage and requires no exact wafer/step orientation.

Just about any size or shape of wafer, whether it be broken, complete, square, round, rectangular or elliptical, can be accommodated by CHA planets.

CHA planetary fixtures feature individually removable planets with high-speed operation. Various planetary sizes for different makes and sizes of vacuum chambers are also available for converting existing vacuum systems into highly productive units.

**Benefits**

Excellent coverage over the step. The patented configuration of CHA rotary fixturing conforms to the cosine distribution law as stated by Knudsen. This results in uniformities of ±5% or better.

Higher yield, greater throughput. Domes can handle large numbers of various size or shape wafers.

High rotation speeds. Domes rotate on water-cooled track at speeds of up to 150 RPM.

Optimal operator efficiency. Individually removable planets are lightweight and easy to handle. The quick-release planet lock and wafer holders require no tools or hardware, thereby permitting fast set-up and removal.

Guards against distortion. Domes are machined from 11-gauge, 304 stainless steel that maintains shape under heat and handling conditions.

**Why CHA Rotary Fixturing Is So Efficient**

As the substrate holder rides around the track at the circumference of the fixturing, it revolves around its center, providing epicyclic motion to each wafer. Because of the domed configuration of the substrate holder, each wafer lies on the surface of a sphere to which the source is tangential, and each wafer presents a constantly changing deposition angle of incidence.

**Knudsen's Law**

The configuration of CHA rotary fixturing applies Knudsen's cosine law to obtain extreme uniformity of deposition. This law of evaporation involves the cosine of the emission angle, and states that the source surface has directional properties, and that all internal surfaces of a sphere which are tangential to the surface of a direct source receive equal amounts of deposited material.

The three planetary domes in the CHA design are arcs of a single sphere. The apex, or center point, of the three domes is one diameter from the source. Thus the CHA geometry conforms to the law expressed by Knudsen.*

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Fast, Easy Planet Removal

The quick-release planet lock makes it easy to remove domes without any special tools or holders.

Features

Water-cooled ring and track assembly. Domes rotate on this stainless steel track at speeds of up to 150 RPM. Water cooling prevents distortion or "working" when heat is applied.

Offset drive assembly. O-ring sealed and differentially pumped, the assembly includes self-aligning, stainless steel gears that are easily removed.

Quick-release clamp. Provides fast, overhead access to the monitor head.

Monitor head. Is located directly above the source for accurate thickness and rate. The entire assembly can be withdrawn and crystal changed conveniently out of the chamber working area.

Stainless steel bell jar. Ambient or water-cooled with externally mounted motor with variable speed control, monitor housing and mounting plate, and sight port.

Fixture support rods. Stainless steel, precision ground to close tolerance to permit use of CHA Industries' cam lock support collars and scissors/shutter assembly.

Bell jar guide rod. Directs up-and-down motion of chamber. Quick release allows chamber rotation for easy cleaning.

Planet hangers. For individually removable planet series.

Frontside loading. Comes with CHA angle tabs. Backside loading planets are also available.
Available Sizes & Capacities

CHA fixturing is available in four standard sizes: 021, 031, 041 and 051. Each handles a variety of wafer sizes and capacities. Refer to typical fixturing cross section diagram and the following chart for dimensions, wafer sizes and capacities.

<table>
<thead>
<tr>
<th>Fixture Model Number</th>
<th>Wafer Diameter and Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2&quot;</td>
</tr>
<tr>
<td>#021-18&quot; Independent Loading</td>
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<td>#021-Dimensions</td>
<td>A = 16&quot;</td>
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<tr>
<td>#031-19½&quot; Independent Loading</td>
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<tr>
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<td>A = 18&quot;</td>
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<td>#041-25 ½&quot; Independent Loading</td>
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<td>#041-Dimensions</td>
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<tr>
<td>#051-32&quot; BJ 34&quot; Baseplate</td>
<td>228</td>
</tr>
<tr>
<td>#051-Dimensions</td>
<td>A = 30&quot;</td>
</tr>
</tbody>
</table>

FL: Frontload  BL: Backload

Retrofit Kit

CHA Industries manufactures a retrofit kit for converting existing fixturing to individual loading. All that's needed is 3-planet hangers (use existing CHA planets), hub support with shielding, and hub assembly.

Optional Equipment

Quartz Lamp Substrate Heater

CHA Industries' quartz lamp heaters are rated at 500 and 1200 watts, and are available in arrays ranging from 1 to 16 kW. All lamps are vacuum-pumped as opposed to conventional heaters, which are iodine-filled.
Heating Accessories

Power supplies range from 2 kW upwards and are equipped with digital temperature set point, analog temperature read-out and a process-ready indicator lamp. Substrate temperature can be manually or automatically controlled. All CHA Industries standard power ratings can be boosted 20% by a transformer.

Glow Discharge

CHA power supplies are rated at 0 to 6000 VAC for ideal conditioning and cleaning of substrates by ion bombardment. Also supplied is a multi-purpose, electrical feedthrough and a low sputter-rate, aluminum-silicon alloy discharge rod.

Cryocoil Liquid Nitrogen Trap

Provides an effective, wide area range trap in the work zone and is particularly effective during evaporation. High pumping speed for condensible vapors results in lower pressures.

Easily Removable Shielding

All stainless steel, CHA shields reduce downtime for clean-up, keep evaporant from critical non-removable parts, enable operators to perform simple clean-up tasks.

- Source shield protects the feedthroughs, vacuum chamber and lower parts of the fixturing.
- Heater shield mounts within the heater assembly to protect the quartz lamps and reflectors.
- Bell jar liner shield can be removed from the bell jar without any tools, and conveniently cleaned.

Shutter Assembly

Features horizontal scissor-type section that allows for a six-inch-diameter clear opening in a small area. Motion is manually actuated with automated motion optionally available. Blades lift off for cleaning or replacement.

Other CHA Fixturing

Clam Shell Backside Gold Fixturing

CHA's Clam Shell Fixture provides highly efficient (up to 75%) collection of gold, silver and other precious metals for coating the backside of 3- and 4-inch wafers. The 25-inch Model 6400/25 handles 80 3-inch wafers or 48 4-inch wafers, and is accommodated inside the CHA Industries' 25-inch bell jar mating to a 26-inch baseplate system. The 18-inch Model 6400/18 carries up to 40 3-inch wafers or 24 4-inch wafers.

Wafers are retained in the "Clam Shell" by the same coil springs (with the "L" tab) that are used on CHA Industries' planetary fixtures.
Dual Face Flip Fixture
CHA's Model 6432/19 Dual Face Flip Fixturing is specifically designed for coating both sides of a substrate in one pumpdown with ±10% uniformity or better.

Optical Fixturing
A wide choice of planetaries and substrate holders are available for optical coating systems with capacities for large substrate sizes, or for several and various sizes and shapes simultaneously.

Rotating Domes
Motor-driven, stainless steel dome accepts commonly used wafers while achieving greater deposition uniformity than is possible with stationary or fixed domes.

Special Planetary Fixturing
CHA can customize fixturing to meet specific needs.

Static Deposition Fixturing
CHA's Static Fixturing is designed for deposition systems using either electron beam or resistance sources. The fixturing is ideal for low production requirements, small-batch production with frequent changes or for research/development laboratories.

Flat Planetary Fixture
Expands versatility of thin-film deposition systems in applications requiring the coating of unusual shapes and sizes of substrates. The all stainless steel, planetary design provides epicyclic motion to optimize film uniformity and coverage.
CHA Industries

4201 Business Center Drive
Fremont, CA 94538-6357
Phone: 510-683-8554
Fax: 510-683-3848
www.chaindustries.com

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